VERIFICATION

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[TITLE OF THE INVENTION]

VEHICLE HEADLAMP AND OPTICAL UNIT

[WHAT IS CLAIMED IS]

[Claim 1]

A vehicle headlamp used for a vehicle, comprising:

a light source for generating light;

a translucent member formed of a material through which said light passes;

a reflector for reflecting said light entering from said light source via said translucent member, said reflector being formed as at least a part of a surface of said translucent member, said reflector having an optical center thereof near said light source; and

a lens for deflecting said light reflected by said reflector and emitting said light out of said vehicle headlamp, said lens being integrally formed with said translucent member.

[Claim 2]

A vehicle headlamp as claimed in claim 1, wherein said light source comprises a semiconductor light emitting element, and

said translucent member comprises a containing section for containing at least a part of said light source to face at least a part of said reflector near said optical center.

[Claim 3]

A vehicle headlamp as claimed in claim 2, wherein said light source further comprises a sealing member for sealing said semiconductor light emitting element, said sealing member being formed of a material through which said light passes,

said containing section contains at least a part of said sealing member, and

refractive index of said translucent member is substantially the same as or larger than that of said sealing member.

[Claim 4]

A vehicle headlamp as claimed in claim 1 further comprising a light shielding member for shielding a part of said light passing through said translucent member forward at an edge section thereof, said light shielding member being formed of a material incapable of passing said light generated by said light source, said light shielding member being integrally formed with said translucent member,

wherein said vehicle headlamp emits said light forward from said vehicle,

said translucent member passes said light reflected by said reflector forward,

said reflector reflects said light generated by said light source near said edge section of said light shielding member, and

said lens emits light forming at least a part of a cut line for determining a boundary between bright and dark with respect to a light distribution pattern of said vehicle headlamp based on a shape of at least a part of said edge section.

[Claim 5]

A vehicle headlamp as claimed in claim 4, wherein said reflector is a first reflector for reflecting said light generated by said light source near said edge section of said light shielding member, said first reflector being formed to cover said light source from the rear of said light source, and

said light shielding member is formed by a second reflector provided as a part of a surface of said translucent member to face said first reflector with said translucent member interposed therebetween.

[Claim 6]

A vehicle headlamp as claimed in claim 1, wherein said reflector is formed of a metal vapor-deposited on at least a part of a surface of said translucent member.

[Claim 7]

A vehicle headlamp as claimed in claim 1, said light source comprises a semiconductor light emitting element, and

said translucent member seals said semiconductor light emitting element.

[Claim 8]

A vehicle headlamp for emitting light forward, comprising:

a light source for generating light;

a translucent member for passing light generated by said light source forward, said translucent member being formed of a material through which said light passes;

a light shielding member for shielding a part of said light passing through said translucent member forward at an edge section thereof, said light shielding member being formed of a material incapable of passing said light generated by said light source, said light shielding member being integrally formed with said translucent member; and

a lens for emitting light forming at least a part of a cut line for determining a boundary between bright and dark with respect to a light distribution pattern of said vehicle headlamp based on a shape of at least a part of said edge section, said lens being integrally formed with said translucent member.

[Claim 9]

An optical unit for emitting light generated by a light source, comprising:

a translucent member formed of a material through which said light passes;

a reflector for reflecting said light entering from said

light source via said translucent member, said reflector being formed as at least a part of a surface of said translucent member, said reflector having an optical center thereof near said light source; and

a lens for deflecting said light reflected by said reflector and emitting said light out of said optical unit, said lens being integrally formed with said translucent member.

[Claim 10]

An optical unit for emitting light generated by a light source, comprising:

a translucent member formed of a material through which said light passes, said translucent member passing said light generated by said light source forward;

a light shielding member for shielding a part of said light passing through said translucent member forward at an edge section thereof, said light shielding member being formed of a material incapable of passing said light generated by said light source, said light shielding member being integrally formed with said translucent member; and

a lens for emitting light forming a cut line with respect to a light distribution pattern of said vehicle headlamp based on a shape of at least a part of said edge section, said lens being integrally formed with said translucent member.

[DETAILED DESCRIPTION OF THE INVENTION]

[0001]

[Field of the Invention]

This invention relates to a vehicle headlamp and an optical unit. Particularly, the present invention relates to a vehicle headlamp which is used for a vehicle.

[0002]

[Description of the Related Art]

For a vehicle headlamp, in view of security, it is necessary to form a light distribution pattern with high precision. In the prior art, a method of forming the light distribution pattern of a vehicle headlamp by an optical system using a reflector and a lens has been known. In addition, a signal lamp for a vehicle using a light emitting diode as a light source has been known (cf. Patent Document 1).

[0003]

[Patent Document 1]

Japanese Patent Application Laying-open No. (Pages 2 to 5, Figs. 1 to 12)

[0004]

[Problems to be Solved by the Invention]

However, in such vehicle headlamp, it is necessary to set the positions of the reflector and the lens with high precision.

Accordingly, the cost of setting the vehicle headlamp might increase.

[0005]

Therefore, it is an object of the present invention to provide a vehicle headlamp and an optical unit, which can solve the foregoing problems. The above and other objects can be achieved by combinations described in the independent claims. The dependent claims define further advantageous and exemplary combinations of the present invention.

[0006]

[Means for Achieving the Objects]

According to the first aspect of the present invention, a vehicle headlamp used for a vehicle, includes a light source for generating light, a translucent member formed of a material through which the light passes, a reflector for reflecting the light entering from the light source via the translucent member, the reflector being formed as at least a part of a surface of the translucent member, the reflector having an optical center thereof near the light source, and a lens for deflecting the light reflected by the reflector and emitting the light out of the vehicle headlamp, the lens being integrally formed with the translucent member.

[0007]

The light source may include a semiconductor light emitting element, and the translucent member includes a containing section for containing at least a part of the light source to face at least a part of the reflector near the optical center.

[0008]

The light source may further include a sealing member for sealing the semiconductor light emitting element, the sealing member being formed of a material through which the light passes, the containing section may contain at least a part of the sealing member, and the refractive index of the translucent member may be substantially the same as or larger than that of the sealing member.

[0009]

The vehicle headlamp may further include a light shielding member for shielding a part of the light passing through the translucent member forward at an edge section thereof, the light shielding member being formed of a material incapable of passing the light generated by the light source, the light shielding member being integrally formed with the translucent member, wherein the vehicle headlamp may emit the light forward from the vehicle, the translucent member may pass the light reflected by the reflector forward, the reflector may reflect the light generated by the light source near the edge section of the light shielding member, and the lens may emit light forming at least a part of a cut line for

determining a boundary between bright and dark with respect to a light distribution pattern of the vehicle headlamp based on a shape of at least a part of the edge section.

[0010]

The reflector may be a first reflector for reflecting the light generated by the light source near the edge section of the light shielding member, the first reflector being formed to cover the light source from the rear of the light source, and the light shielding member may be formed by a second reflector provided as a part of a surface of the translucent member to face the first reflector with the translucent member interposed therebetween.

[0011]

The reflector may be formed of a metal vapor-deposited on at least a part of a surface of the translucent member. The light source may include a semiconductor light emitting element, and the translucent member may seal the semiconductor light emitting element.

[0012]

According to the second aspect of the present invention, a vehicle headlamp for emitting light forward, includes a light source for generating light, a translucent member for passing light generated by the light source forward, the translucent member being formed of a material through which the light passes, a light shielding member for shielding a part of the light passing through the translucent member forward at an edge section thereof, the light shielding member being formed of a material incapable of passing the light generated by the light source, the light shielding member being integrally formed with the translucent member, and a lens for emitting light forming at least a part of a cut line for determining a boundary between bright and dark with respect to a light distribution pattern of the vehicle headlamp based on a shape of at least a part of the edge section, the lens being integrally formed with the translucent member.

[0013]

According to the third aspect of the present invention, an optical unit for emitting light generated by a light source, includes a translucent member formed of a material through which the light passes, a reflector for reflecting the light entering from the light source via the translucent member, the reflector being formed as at least a part of a surface of the translucent member, the reflector having an optical center thereof near the light source, and a lens for deflecting the light reflected by the reflector and emitting the light out of the optical unit, the lens being integrally formed with the translucent member.

[0014]

According to the fourth aspect of the present invention,

an optical unit for emitting light generated by a light source, includes a translucent member formed of a material through which the light passes, the translucent member passing the light generated by the light source forward, a light shielding member for shielding a part of the light passing through the translucent member forward at an edge section thereof, the light shielding member being formed of a material incapable of passing the light generated by the light source, the light shielding member being integrally formed with the translucent member, and a lens for emitting light forming a cut line with respect to a light distribution pattern of the vehicle headlamp based on a shape of at least a part of the edge section, the lens being integrally formed with the translucent member.

[0015]

The summary of the invention does not necessarily describe all necessary features of the present invention. The present invention may also be a sub-combination of the features described above.

[0016]

[Preferred Embodiments of the Invention]

The invention will now be described based on the preferred embodiments, which do not intend to limit the scope of the present invention, but exemplify the invention. All of the features and the combinations thereof described in the embodiment are not necessarily essential to the invention.

[0017]

Fig. 1 shows an example of the configuration of a vehicle lamp 400 according to an exemplary embodiment of the present invention. It is an object of this embodiment to provide a vehicle lamp 400 with highly optical precision at low cost. The vehicle lamp 400 which is a vehicle headlamp for low beam emission contains a plurality of light source units 100 arranged in an approximately horizontal line inside a lamp chamber consisting of a translucent cover 402 and a lamp body 404.

[0018]

These light source units 100 have the same configuration as one another, and their light axes are arranged downwards by, e.g. 0.2 to 0.4° against the forward and backward direction of the vehicle.

[0019]

The vehicle lamp 400 forms a predetermined light distribution pattern by emitting light forward from the vehicle based on the light emitted by those light source units 100. The vehicle lamp 400 may include a plurality of light source units 100 whose light distribution characteristics are different from each other.

[0020]

Figs. 2 and 3 show an example of the configuration of the light source unit 100. Fig. 2 shows a vertically sectional view BB of the light source unit 100. Fig. 3 shows a horizontally sectional view AA of the light source unit 100. The light source unit 100 of the this embodiment which is a projector type for emitting the light condensed and reflected near the optical axis via the lens includes a translucent member 118 for holding a light source 126 and a reflecting section 110 formed as a part of the surface of the translucent member 118.

[0021]

The light source 126 which is a light emitting diode module for generating white light includes a semiconductor light emitting element 102 and a sealing member 116. In this embodiment, the semiconductor light emitting element 102 is a light emitting diode (LED) for generating blue light, and generates yellow light complementary to the blue light from a fluorescent body (not shown) arranged on the surface by emitting the blue light towards the fluorescent body. In this case, the light source 126 generates the white light based on the blue and yellow light generated by the semiconductor light emitting element 102 and the fluorescent body. In another embodiment, a semiconductor light emitting element 104 may generate the white light from the fluorescent body by emitting infrared light towards the fluorescent body.

[0022]

The sealing member 116 is a half-spherical mold formed of a translucent material to the white light, and seals the semiconductor light emitting element 102. The translucent member 118 includes a rear section 120, an intermediate section 104, and a lens 112. The rear section 120, the intermediate section 104, and the lens 112 are integrally formed of a material translucent to the white light such as transparent resin or glass.

[0023]

The rear section 120 formed to cover the light source 126 passes the light generated by the light source 126 towards the lens 112. In addition, the rear section 120 includes a hole-shaped containing section 114 formed to be approximately half-spherically dented downwards from an opening section provided at a lower surface of the rear section 120 towards the inside of the rear section 120. The containing section 114 contains at least a part of the sealing member 116, and thus contains at least a part of the light source 126 in order that the part faces at least a part of the reflecting section 110.

[0024]

Here, the containing section 114 holds the light source 126 approximately upwards at a predetermined position by allowing an internal wall surface to be in approximate contact with an external

wall surface of the sealing member 116. Accordingly, the light source 126 can be fixed with high precision. Further, the containing section 114 may be formed to be dented from an upper surface or side surface of the rear section 120, and in this case it may hold the light source 126 downwards or horizontally.

[0025]

And, the refractive index of the rear section 120 may be the same as or larger than that of the sealing member 116, and for example may be formed of the same resin as the sealing member 116. Accordingly, the rate of the reflection by the wall surface of the containing section 114 with regard to the light generated by the semiconductor light emitting element 102 can be reduced. The gap between the containing section 114 and the sealing member 116 may be filled with, e.g. transparent resin whose refractive index is approximately the same as those. And, the sealing member 116 may be integrally formed with the rear section 120.

[0026]

Here, the lower surface of the rear section 120 is approximately horizontal, and the rear surface is an approximately oval spherical surface formed to be curved forward and upwards from a rear edge of the lower surface. This approximately oval spherical surface is set in order that the cross-section of the light source unit 100 including its axis becomes at least a part of an approximately oval shape. In addition, the eccentricity of the approximately oval shape is set to become gradually large from the vertical section towards the horizontal section. Further, the light source unit 100 has its axis which faces approximately forward from the vehicle at the approximate center of the lower surface of the rear section 120.

[0027]

The intermediate section 104 is formed to extend from the front of the rear section towards the rear of the lens 112, and transmits the light generated into the rear section 120 by the light source 126 towards the lens 112. In this embodiment, the lower surface of the intermediate section 104 is formed to be inclined forward and downwards to transmit the light reflected by the reflecting section 110 towards the lens 112 efficiently.

[0028]

The lens 112 is a convex lens formed on the light source unit 100 to extend forward from the front of the intermediate section 104, and deflects the light reflected by reflecting section 110 and emits it out of the light emitting unit 100. In this embodiment, the lens 112 is integrally formed with the translucent member 118 by becoming a part of the translucent member 118. Therefore, according to this embodiment, the position of the lens 112 can be determined with high precision.

[0029]

In another embodiment, the lens 112 may be formed to be separated from the rear section 120 and the intermediate section 104. In this case the lens 112 is integrally formed with the translucent member 118 by attaching it to the translucent member 118 including the rear section 120 and the intermediate section 104. Also in this case, the position of the lens 112 can be determined with high precision.

[0030]

The reflecting section 110 is a reflector formed of a metal vapor-deposited on at least a part of the surface of the rear section 120, and reflects the light generated by the light source 126. Further, in this embodiment, no metal is vapor-deposited on the surfaces of the intermediate section 104 and the lens 112, and no reflector is formed on the surfaces of the intermediate section 104 and the lens 112.

[0031]

The reflecting section 110 includes reflectors 108 and 106. The reflector 108 is formed to be approximately parallel to at least a part of the lower surface of the rear section 120 while facing the reflector 106 with the rear section 120 interposed therebetween, and reflects both the light generated by the light source 126 and the light reflected downwards by the reflector 106.

[0032]

Here, the reflector 108 is formed of a metal not translucent to the light generated by the light source 126. Accordingly, in this embodiment, the reflector 108 has a function of a light-shielding member (shade) integrally formed with the rear section 120. The reflector 108 forms a boundary between bright and dark in response to the shape of a front edge by shielding a part of the light passed downwards by the rear section 120 with regard to the front edge.

[0033]

In addition, the reflector 106 is a complex oval reflector with the shape of at least a part of the approximately oval spherical surface, and is formed to cover the light source 126 while extending forward and upwards from the rear edge of the reflector 108 on at least a part of the upper or rear surface of the rear section 120. And, the reflector 107 has an optic center that is, e.g. a reference point for optical design, near the light source 126, and reflects the light entering from the light 126 via the rear section 120 to the vicinity of the front edge of the reflector 108. The reflector 106 is formed in the shape of a curved surface whose optic center is its focus.

[0034]

Hereinafter, the position relation among the light source

126, the reflector 106 and the lens 112 will be described in further detail. In this embodiment, the reflector 106 has its focuses F1 and F2 approximately on the reflector 108, and reflects the light entering from the focus F1 towards the focus F2. The reflector 106 may have its focus F1 positioned at the optic center.

[0035]

Here, in this embodiment, the opening section of the containing section 114 is provided near the focus F1 on the lower surface of the rear section 120. Accordingly, the containing section 114 holds the light source 126 to face the reflector 106. In this case, the semiconductor light emitting element 102 is arranged near the focus F1.

[0036]

In addition, the reflector 106 has its focus F2 near the center of the front edge of the reflector 108 in the left and right direction. Accordingly, the reflector 106 condenses at least most of the light generated the semiconductor light emitting element 102 near the center of the front edge of the reflector 108.

[0037]

Further, each part of the reflector which is a complex oval reflector may be formed as a curved surface having a common focus F1 and a focus F2 positioned near the front edge of the reflector 108, each of the focuses F2 being differently positioned. For example, the focus F2 of a front section of the vehicle may positioned more forward than the focus F2 corresponding to a rear section of the vehicle.

[0038]

The lens 112 emits the light generated by the semiconductor light emitting element 102 forward from the vehicle. In this embodiment, the lens 112 has its focus near the center of the front edge of the reflector 108. In this case, the lens 112 emits the light condensed approximately near the center forward from the vehicle as approximately parallel light. The lens 112 may emit the light condensed on the focus F2 of the reflector 106 towards the optical axis.

[0039]

As described above, the reflector 106 is formed on the surface of the translucent member 118 integrally formed with the lens 112. In addition, the light source 126 is held by the containing section 114 formed at the translucent member 118. Therefore, according to this embodiment, the positions among the light source 126, the reflector 106 and the lens 112 can be highly precisely determined without any assembling process requiring high precision.

[0040]

Further, the reflector 106 condenses the light generated by the light source 126 near the center of the front edge of the

reflector 108 with high precision. The lens 112 emits the light condensed near the center of the edge forward with high precision. Therefore, according to this embodiment, the light distribution pattern can be formed with high precision.

[0041]

In addition, since the reflector 106, the lens 112, etc. are integrally formed, the numbers of the assembly parts and the assembly work steps can be reduced. Therefore, according to this embodiment, a vehicle lamp of highly optical precision assembled with a few parts can be provided at low cost.

[0042]

Further, according to this embodiment, an optical source unit 100 including the semiconductor light emitting element 102 with simple configuration can be provided. In this case, due to simplification of configuration, the light source unit 100 can be small in size. According to this embodiment, the length of the light source unit 100 in the forward and backward direction can be reduced to about 50 to 70mm. In addition, the width of the reflector 106 in the left and right direction can be reduced to about 20 to 30mm. In this case, since a plurality of light source units 100 can be used, the light distribution design can be performed easily and flexibly by assembling the plurality of light source units 100 whose light distribution characteristics are different from each other.

[0043]

Further, in another embodiment, the translucent member 118 may directly seal the semiconductor light emitting element 102 in place of the translucent member 118. In this case, the light generated by the semiconductor light emitting element 102 can be given efficiently to the translucent member 118. In addition, the semiconductor light emitting element 102 may be a semiconductor laser. The translucent member 118, the reflector 110, and the lens 112 may constitute an optical unit for deflecting the light generated by the light source 126.

[0044]

In addition, another embodiment, the translucent 118 may be formed of a transparent colored material. In this case, the light source unit 100 emits colored light based on the color of such material. For example, the light source unit 100 may be used as a foglamp for emitting yellow light, and in this case the translucent member 118 may be formed of a yellow transparent material. In addition, the light source unit 100 may be used as a rear foglamp for emitting red light, and in this case the translucent member 118 may be formed of a red transparent material.

[0045]

Fig. 4 shows a vertically sectional view CC of the light

source unit 100 by a surface perpendicular to the traveling direction of the vehicle. In this embodiment, the reflector 108 includes a horizontal cut-off formation surface 122 formed to horizontally extend to the left in the drawing from the optical axis of the light source unit 100, and a slanting cut-off formation surface 124 formed to extend to the right in the drawing slanting downwards by 15° from the optical axis, and has its focus F2 near the boundary of the front edge between the horizontal cut-off formation surface 122 and the slanting cut-off formation surface 124. Accordingly, the front edge of the reflector 108 is formed in the shape of a letter '∧' to extend to the left and right from the optical axis of the vehicle lamp 400 (cf. Fig. 1) with the focus F2 regarded as the approximate center.

[0046]

In this case, the reflector condenses the light generated by the light source 126 near the front edge of the reflector 108 in the shape of a letter '∧'. Accordingly, the lens 112 (cf. Fig. 2) emits the light which forms at least a part of a cut line determining the boundary between bright and dark with regard to the light distribution pattern of the vehicle lamp 400 based on the shape of at least a part of the front edge of the reflector 108. In this embodiment, since the front edge is positioned with high precision to the light source 126 (cf. Fig. 2), the reflector 106, the lens 112 (cf. Fig. 2), etc., a clear cut line can be formed firmly.

[0047]

Fig. 5 shows an example of a light distribution pattern 202 formed by the light source unit 100 and the light source unit 100 translucently viewed from the rear thereof. The light distribution pattern 202 is a low beam light distribution pattern formed on a vertically virtual screen disposed 25 meters away from the front of the light source unit 100.

[0048]

In this embodiment, the light source unit 100 forms the light distribution pattern having a horizontal cut line 206 and a slanting cut line 204 by projecting the image of the surface including the front edge of the reflector 108 onto the vertically virtual screen. The light source unit 100 forms the horizontal cut line 206 based on the shape of the front edge of the horizontal cut-off formation surface 122 (cf. Fig. 4), and the slanting cut line 204 based on the shape of the front edge of the slanting cut-off formation surface 124. In this embodiment, a clear cut line can be formed firmly.

[0049]

Further, in another embodiment, the vehicle lamp 400 (cf.

Fig. 1) may form the light distribution pattern 202 based on the light generated by a plurality of light source units 100 whose light distribution characteristics are different from each other. In this case, each of the light source units 100 may emit a partial area of the light distribution pattern 202.

[0050]

Figs. 6 and 7 show another example of the configuration of the light source unit 100. Fig. 6 shows a vertically sectional view BB of the light source unit 100. Fig. 7 shows a horizontally sectional view AA of the light source unit 100.

[0051]

In this embodiment, the translucent member 118 further has a function which is the same as or similar to that of the sealing member 116 (cf. Fig. 2), and seals the semiconductor light emitting element 102. In this case, since the translucent member 118 has the same or similar function as a resin mold of a light emitting diode module, it can allow the light generated by the semiconductor light emitting element 102 to enter the translucent member 118 highly efficiently. In addition, since the translucent member 118 including the lens 112 seals the semiconductor light emitting element 102, the lens 112 can emit the light generated by the semiconductor light emitting element 102 forward from the vehicle highly efficiently.

[0052]

Further, according to this embodiment, since the translucent member 118 directly seals the semiconductor light emitting element 102, the light source unit 100 can be miniaturized, e.g. the diameter of the lens 112 is further small about 10mm. In addition, according to this embodiment, by further reducing the number of assembly parts, the light source unit 100 can be provided with further lower cost. With regard to the different points, the matters in Figs. 6 and 7 given the same symbols as those in Figs. 2 and 3 will not be described because they have the same configuration and function as those in Figs. 2 and 3.

[0053]

Figs. 8 and 9 show further another example of the configuration of the light source unit 100. Fig. 8 shows a vertically sectional view BB of the light source unit 100. Fig. 9 shows a horizontally sectional view AA of the light source unit 100.

[0054]

In this embodiment, the intermediate section 104 includes a peripheral section 502 formed to project outwards from an area connecting the front of the rear section 120 to the rear of the lens 112, and a reflector 502 formed on the peripheral section 502 by, e.g. metal vapor deposition. The surface of the peripheral section 502 is formed to extend forward from the front edge of

the rear section 120 in order that the distance from the optical axis of the light source unit 100 gradually increases. In addition, the front edge of the peripheral section 502 is a translucent and approximately vertical surface formed to extend from the rear of the lens 112 in order to be away from the axis of the light source unit 100. The peripheral section 502 may be formed at an area above a horizontal surface approximately including the lower surface of the rear section 120.

[0055]

Here, the outer surface of the peripheral section 502 has the shape which a part of a parabola with a focus near the semiconductor light emitting element 102. In this case, the reflector 504 reflects the light generated by the semiconductor light emitting element 102 forward as approximately parallel light. The reflector 504 emits the reflected light forward by passing it through the front surface of the peripheral section 502. Further, the reflector 504 may be integrally formed with the reflecting section 110.

[0056]

According to this embodiment, the semiconductor light emitting element 102 can emit the generated light forward with high efficiency. With regard to the different points, the matters in Figs. 8 and 9 given the same symbols as those in Figs. 6 and 7 will not be described because they have the same configuration and function as those in Figs. 6 and 7.

[0057]

Fig. 10 shows an example of a light distribution pattern 202 formed by the light source unit 100 described in connection with Figs. 8 and 9 and the light source unit 100 translucently viewed from the rear thereof. In this embodiment, the reflector 504 in the shape of a parabola emits the light generated by the semiconductor light emitting element 102 disposed at the focus towards a center area 702 near the point at which the slanting cut line 204 and the horizontal cut line 206 are crossing.

[0058]

Therefore, according to this embodiment, the light can be emitted near the center of the cut line with high luminance. In addition, a clear cut line can be formed further firmly. With regard to the different points, the matters in Fig. 10 given the same symbols as those in Fig. 5 will not be described because they have the same configuration and function as those in Fig. 5.

[0059]

Figs. 11 and 12 show further another example of the configuration of the light source unit 100. Fig. 11 shows a vertically sectional view BB of the light source unit 100. Fig. 12 shows a horizontally sectional view AA of the light source unit

100.

[0060]

In this embodiment, the containing section 114 is formed to be dented forward from the rear surface of the rear section 120, and fixes the semiconductor light emitting element 102 to face forward from the vehicle. Accordingly, the semiconductor light emitting element 102 emits the light forward.

[0061]

And, the light source unit 100 includes a light shielding member 602 integrally formed with the translucent member 118. The translucent member 118 is formed to extend in the inner and upward direction of the translucent member 118 from the lower surface of the translucent member 118 in order that the translucent member 118 is curved backwards at the center in the left and right direction of the vehicle with regard to its lower surface. The translucent member 602 shields a part of the light emitted into the translucent member 118 by the semiconductor light emitting element 102 with regard to the upper edge.

[0062]

The translucent member 602 is formed to fill a hollow formed being dented inwards from the surface of the translucent member 118 with a translucent member. The translucent member 602 may be formed to be coated with, e.g. black on the wall surface of its hollow. The translucent member 602 and the translucent member 118 may be integrally formed altogether by two-color insertion molding.

[0063]

In addition, the lens 112 includes its focus near the upper edge of the translucent member 602. In this case, the lens 112 forms at least a part of the cut line of the light distribution pattern by emitting the boundary between bright and dark forward based on the upper edge shape of the translucent member 602. With regard to the different points, the matters in Figs. 11 and 12 given the same symbols as those in Figs. 2 and 3 will not be described because they have the same configuration and function as those in Figs. 2 and 3.

[0064]

Also in this embodiment, since the semiconductor light emitting element 102, the translucent member 602, and the lens 112 are positioned with high precision, the light source unit 100 can form its light distribution pattern with high precision. In addition, according to this embodiment, the light source unit 100 can be manufactured at low cost by reducing the number of the assembly parts, and its size can be reduced due to the simplification of its configuration.

[0065]

Further, in this embodiment, the light source unit 100 further

includes a reflector 606 formed as at least a part of the side surface of the translucent member 118. The reflector 606 reflects the light generated in the side surface direction to the light axis of the light source unit 100 by the light source 126 forward and allows it to enter the lens 112. Accordingly, the light generated by the light source 126 can be used with high efficiency. The lens 112 may emit the light reflected by the reflector 606 towards a part other than the cut line of the light distribution pattern as, e.g. diffuse light. And, the light source unit 100 may further have a reflector on, e.g. the upper surface of the translucent member 118.

[0066]

In addition, the semiconductor light emitting element 102 may be sealed directly by the rear section 120 together with the semiconductor light emitting element 102 described in connection with Figs. 6 and 7. In this case, the size of the light source unit 100 can be further reduced.

[0067]

Fig. 13 shows another example of the configuration of the vehicle lamp 400. In this embodiment, the vehicle lamp 400 includes a plurality of light source units 100 arranged in the shape of arrays.

[0068]

In this embodiment, the light source unit 100 may have the same or similar configuration as the light source unit 100 described in connection with Figs. 6 and 7. In this case, the lens 112 (cf. Fig. 6) of the light source unit 100 is small, e.g. about 10mm in diameter. Therefore, according to this embodiment, the size of the vehicle lamp 400 including a lot of light source unit 100 can be reduced.

[0069]

Here, the light distribution characteristics of the plurality of the light source unit 100 may be different from each other. In this case, a variety of kinds of light source units 100 whose light distribution characteristics are different from each other can be used. Therefore, according to this embodiment, the light distribution of the light source unit 100 can be designed easily and flexibly. In addition, the proper light distribution pattern can be formed. With regard to the different points, the matters in Fig. 13 given the same symbols as those in Fig. 1 will not be described because they have the same configuration and function as those in Fig. 1.

[0070]

Although the present invention has been described by way of an exemplary embodiment, it should be understood that those skilled in the art might make many changes and substitutions without

departing from the spirit and the scope of the present invention, which is defined only by the appended claims.

[0071]

[Advantages of the Invention]

As obvious from the description above, according to the present invention, the cost of the vehicle lamp can be reduced.

[BRIEF DESCRIPTION OF THE DRAWINGS]

Fig. 1 shows an example of the configuration of a vehicle lamp 400 according to an exemplary embodiment of the present invention.

Fig. 2 shows a vertically sectional view BB of the light source unit 100.

Fig. 3 shows a horizontally sectional view AA of the light source unit 100.

Fig. 4 shows a vertically sectional view CC of the light source unit 100.

Fig. 5 shows an example of a light distribution pattern 202 formed by the light source unit 100.

Fig. 6 shows a vertically sectional view BB of the light source unit 100.

Fig. 7 shows a horizontally sectional view AA of the light source unit 100.

Fig. 8 shows a vertically sectional view BB of the light source unit 100.

Fig. 9 shows a horizontally sectional view AA of the light source unit 100.

Fig. 10 shows an example of a light distribution pattern 202.

Fig. 11 shows a vertically sectional view BB of the light source unit 100.

Fig. 12 shows a horizontally sectional view AA of the light source unit 100.

Fig. 13 shows another example of the configuration of the vehicle lamp 400.

[List of the Elements]

100 light source unit, 102 semiconductor light emitting element, 104 intermediate section, 106 reflector, 108 reflector, 110 reflector, 112 lens, 114 containing section, 116 sealing member, 118 translucent member, 120 rear section, 122 horizontal cut-off formation surface, 124 slanting cut-off formation surface, 126 light source, 202 light distribution pattern, 204 slanting cut line, 206 horizontal cut line, 400 vehicle lamp, 402 transparent cover, 404 lamp body, 502 peripheral section, 504 reflector, 602 translucent member, 606 reflector, 702 center area

[DOCUMENT] ABSTRACT

[ABSTRACT]

[OBJECT]

It is to reduce the cost of a vehicle lamp.

[MEANS FOR ACHIEVING THE OBJECT]

A vehicle headlamp used for a vehicle includes a light source for generating light, a translucent member formed of a material through which the light passes, a reflector for reflecting the light entering from the light source via the translucent member, the reflector being formed as at least a part of a surface of the translucent member, the reflector having an optical center thereof near the light source, and a lens for deflecting the light reflected by the reflector and emitting the light out of the vehicle headlamp, the lens being integrally formed with the translucent member. The light source may include a semiconductor light emitting element, and the translucent member includes a containing section for containing at least a part of the light source to face at least a part of the reflector near the optical center.

[SELECTED FIGURE]

Fig. 2